

# Egocentric Visual Analysis of Motorcyclist Footage

A Pilot Study of Biker-Mounted Camera Perspectives

- PEDESTRIAN RISK
- HAZARD ZONE

GAP?



## The Environmental Challenge: Unstructured Roads

1

Absence of Defined Lanes: Traffic flows organically rather than following marked lanes, leading to "Implicit Negotiation" between drivers.

2

Heterogeneous Traffic Mix: High diversity of agents (Rickshaws, CNGs, Bikes, Pedestrians) sharing the same lane

3

High Density Occlusion: Frequent visual obstruction caused by large vehicles.



## The Behavioral Challenge: Ambiguity in Decision Making

1

Implicit Negotiation: Right-of-way is determined by eye contact, horn usage, and aggressive maneuvering rather than traffic signals or rules.

2

Predictive Uncertainty: Lack of lane discipline makes predicting the trajectory of surrounding vehicles difficult.

3

Context-Dependent Risk: Risks vary rapidly based on road surface (potholes) and congestion levels



# → Action Frequency Distribution

## Corpus Statistics

- Total videos: 11
- Total Duration: 218min
- Event Categories: 19
- Total Event Frequency: 184

1

High-Frequency Actions

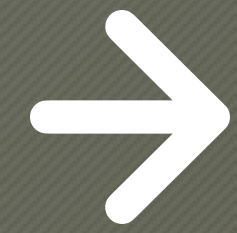
2

Moderate-Frequency Actions

3

Low-Frequency Actions





# High-Frequency Actions

Total Events Observed: 114





# Dominant Traffic Behaviors

## 1. Speed Dynamics (57 events)

- a. Slow Speed - 42
- b. High Speed - 15

## 2. Critical Violations

- a. Wrong Side Entry - 32

## 3. External Hazards (40 events)

- a. Pedestrian Crossing - 23
- b. Uneven Roads - 17



# Speed Dynamics - Slow Speed

Analysis of environmental factors dictating Ego-Vehicle velocity

- DYNAMIC OBSTACLES (27)
  - Front Vehicle Interaction: 16
  - Pedestrians Crossing: 5
  - Traffic Jam / Congestion: 3
  - Animals: 3
- STATIC INFRASTRUCTURE (15)
  - Speed Breakers: 15





# Speed Dynamics - High Speed

Analysis of environmental factors dictating Ego-Vehicle velocity

- CLEAR ROAD
- OBSERVATION

Average sustained speeds of 55-75 km/h  
Over Speed than Speed Sign



# Wrong Side Vehicle Entry

Wrong-side driving is a common "unstructured" behavior used to bypass congestion or avoid U-turns.

Total Incidents: 32

## Agile /Light Vehicles(90%)

- High acceleration, easy to maneuver in wrong lanes
- **Motorbikes: 8**
- **E-Rickshaws (TomTom): 7**
- **CNGs & Rickshaws: 12**
- **Bicycles: 2**

## Heavy Vehicles (10%)

- *Harder to maneuver, rarely violate lanes.*
- **Cars/Micros: 2**
- **Trucks: 1**



# Wrong Side Vehicle Entry: Clips





# Pedestrian Crossing Dynamics: Intent vs. Ambiguity



## Signaling (Explicit Intent)

- Hand gestures to halt traffic flow

## Non-Signaling (Implicit Ambiguity)

- Creates a conflict without intent

Two distinct patterns of mid-block crossing on unstructured roads.



# Pedestrian Crossing Dynamics: Clips





# Surface Analysis

## Breakdown of Environmental Speed Constraints

### SURFACE GEOMETRY

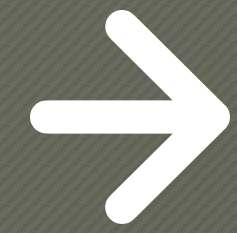
Potholes / Holes: 6  
Broken Roads: 3  
General Unevenness: 2

### SURFACE CONDITION

Wet Surface: 5







# Moderate- Frequency Actions

Total Events Observed: 48



# Interaction Dynamics & Ambiguity

## Category 1: Behavioral Uncertainty (16 Events)

- *The "Will they/Won't they" problem.*
- **Turning Actions: 7** (*Vehicle intended to turn & turned*)
- **Aborted Crossings (Vehicle): 4** (*Vehicle tried to cross but stopped*)
- **Aborted Crossings (Pedestrian): 5** (*Pedestrian stepped out but didn't cross*)



# Interaction Dynamics & Ambiguity

## Category 2: Lateral Maneuvers (21 Events)

- *Objects moving sideways across the frame.*
- Blind Spot Intrusion: 8
- Overtaking: 7
- Lane Changes: 6



# Interaction Dynamics & Ambiguity

## Category 3: Obstacles (11 Events)

- Animals: 4
- Physical Obstructions: 4
- Toll Box Stops: 3



# Blind Spot Movement

## Motorized Intrusions

- Peripheral Turn Entry - 1
- Cut-In Maneuver - 2

## NMV (Non-Motorized Vehicle) Intrusion

- Bi-Cycle Crossing - 1
- Rickshaw Crossing - 4

## VRU (Vulnerable Road User) Appearance

- Pedestrian Crossing - 1





# Vehicle intended to turn and turned

Total Validated Turns: 7 Events

## 1. Agile Maneuvers (Sharp Turning Radius)

- *Challenge: Sudden angular changes with minimal signaling.*
- **Vehicles:** Bike (1), E-Rickshaw (1), Paddle Rickshaw (1).

## 2. Wide-Arc Maneuvers (Large Turning Radius)

- *Challenge: Vehicle occupies multiple lanes during the turn (Occlusion).*
- **Heavy:** Bus (1), Truck (1).
- **Light:** Microbus (1), Mini Pickup (1).





# Behavioral Ambiguity: Aborted Turns

Total Aborted Maneuvers: 4 Events

## 1. Non-Motorized Vehicles (NMV): 3

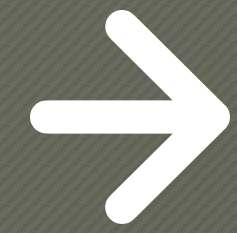
- Rickshaws: 2.
- Bi-Cycle: 1

## 2. Motorized Vehicles: 1

- CNG: 1







# Low-Frequency Actions

Total Events Observed: 7



# Critical Anomalies & Edge Cases

## Category 1: Safety-Critical Events (3 Events)

**Sudden Stops (2):** Front vehicle performs emergency braking.

**Accident (1):** A collision or near-miss event.

## Category 2: Rare Regulatory Elements (2 Events)

**Traffic Police Signal (1)**

**Speed Sign (1)**

## Category 3: Behavioral Noise (2 Events)

Vehicle signaled but didn't turn.

Vehicle attempted to cross and succeeded.



# Critical Anomalies & Edge Cases - Clips







# Thank you

Detailed event log

References: [https://docs.google.com/spreadsheets/d/1lbPVVtK\\_ajSWSqTRic9-uXiVYyjdeQO3njEVs\\_tJxr0/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1lbPVVtK_ajSWSqTRic9-uXiVYyjdeQO3njEVs_tJxr0/edit?usp=sharing)